

Forces

Explore these exhibits to learn more about some of the forces that helped shape Rochester.

Think About It

- Where are **forces** and how do they affect how things move at each exhibit?
- How are forces like **friction**, **gravity**, and **inertia** related to one another?

Path

DISCOVER R WEATHER

- Try using the **wind** to move the clouds around? Can you **predict** which way they will move? What do you have to change to make them move faster or slower, left or right?



CANAL LOCK

- What do you think makes the propellers spin under each lock?
- What would be some advantages to using the canal to carry goods instead of a train or horse and wagon?



PULLEYS

- Each chair has a different number of **pulleys**. How is the number of pulleys related to the **mechanical advantage** used to lift the seat?



SAILING

- Try moving a boat along each arrow path, without pushing it. Where was the air moving across the sail that made the boat move?
- What forces work together to move the boat?



R.O.V.

- There are 4 pumps on the R.O.V. (Remotely Operated Vehicle) that push out water. How is the force and direction of this water related to the motion of the R.O.V.?



How to use this guide

To help guide your visit, we have developed this learning pathway to explore a specific topic using some of the exhibit components.

- Look up the words in bold in the vocabulary list on the back.
- Continue your investigations into other areas of the museum by checking out "Where To Learn More" on the back of this page.
- Follow this path as you explore the gallery, try a different path, or create your own pagravth and follow where your curiosity takes you!

What's Going On?

A **force** is defined as a push or a pull. We describe forces and movement by position, direction, and speed. Something cannot move unless a force is exerted on it, and once it starts moving, it won't stop unless another force acts on it. This is called **inertia**. When something moves it usually rubs against whatever it moves on, like the floor, water, or even air. This rubbing causes a force called friction, which slows the object down. When you push on something to start it moving, there is an equal force pushing against you. Together, these laws make up **Newton's Laws of Motion**.



Where to find more...

Exhibits

- Raceways
- How Things Work
- Turbulent Landscapes
- Expedition Earth

Other Experiences

- Carlson Inquiry Room
- Pressure Show

(check for booking availability)

Read More About It!

B. K. Hixson

Bernoulli's book: A Collection of 25 Experiments That Teach the Basics of Air Pressure, Bernoulli's Law, and Newton's Laws of Motion to Anklebiters

Wild Goose Publications, 1991

P.C.W. Davies

Forces of Nature

Cambridge University Press, 1979

Physics Learning Resource

<http://web.archive.org/web/20050208005712/http://www.exploratorium.edu/ti/resources/physics.html>

Sally Nankivell-Aston, et al.

Science Experiments With Simple Machines

Franklin Watts, 2000

Scientific Eye: Gravity (VHS, 20 minutes)

Yorkshire Television
Journal Films, Inc, 1987

Adrienne Mason, et al

Simple Machines (Starting With Science)

Kids Can Press, 2000

Force - A push or a pull.

Friction - The force that tends to slow down moving objects that are touching.

Gravity - A force that acts at a distance and attracts objects toward each other. The force that attracts objects toward the center of the Earth.

Inertia - The tendency of an object to resist a change in motion.

Mechanical Advantage - A term used in science that describes how much a machine multiplies the force put into it.

Newton's Laws of Motion - The three laws of motion: **#1)** An object at rest remains at rest. An object in motion remains in motion. **#2)** A force is directly related to an objects mass and acceleration. **#3)** With every force there is an equal, but opposite, force.

Predict - To guess what will happen based on observation and information.

Pressure - The force used over a given area by a solid, liquid, or gas.

Pulley - A simple machine consisting of a rope running over a groove in a wheel. You can pull on the rope, changing the direction of the lifting force. A pulley makes it easier to lift heavy loads.

Simple Machines - Any device that only requires the application of a single force to work. They are tools used to make work easier.

Wind - Air moving with force from an area of high pressure to an area of low pressure.

NYS Learning Standards

CDOS1: Career Development

SS1: History of the United States and New York (3)

SS3: Geography (1,2)

SS4: Economics (1)

ELA1: Language for Information and Understanding

MST1: Analysis, Inquiry, and Design (1,2)

MST4: The Physical Environment (2,3,4,5)

MST4: The Living Environment (1,3,7)

MST5: Technology (2,3,4,6)

